Document Number: MRFG35010MT1
Rev. 5, 2/2006

Replaced by MRFG35010NT1. There are no form, fit or function changes with this part replacement. N suffix added to part number to indicate transition to lead-free terminations.

MRFG35010MT1

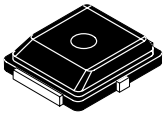
Gallium Arsenide PHEMT

RF Power Field Effect Transistor

3.5 GHz, 9 W, 12 V
POWER FET
GaAs PHEMT

Designed for WLL/MMDS/BWA or UMTS driver applications with frequencies from 1.8 to 3.6 GHz. This device is unmatched and is suitable for use in Class AB linear base station applications.

- Typical W-CDMA Performance: -42 dBc ACPR, 3.55 GHz, 12 Volts, I_{DQ} = 180 mA, 5 MHz Offset/3.84 MHz BW, 64 DPCH (8.5 dB P/A @ 0.01% Probability)
  - Output Power — 900 mW
  - Power Gain — 10 dB
  - Efficiency — 28%
- 9 Watts P1dB @ 3.55 GHz
- Excellent Phase Linearity and Group Delay Characteristics
- High Gain, High Efficiency and High Linearity
- In Tape and Reel. T1 Suffix = 1000 Units per 12 mm, 7 inch Reel.



CASE 466-03, STYLE 1
PLD-1.5
PLASTIC

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Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	15	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	22.7(2) 0.15(2)	W W/°C
Gate-Source Voltage	V_{GS}	-5	Vdc
RF Input Power	P_{in}	33	dBm
Storage Temperature Range	T_{stg}	-65 to +150	°C
Channel Temperature(1)	T_{ch}	175	°C
Operating Case Temperature Range	T_C	-20 to +85	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	6.6(2)	°C/W

Table 3. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	1	260	°C

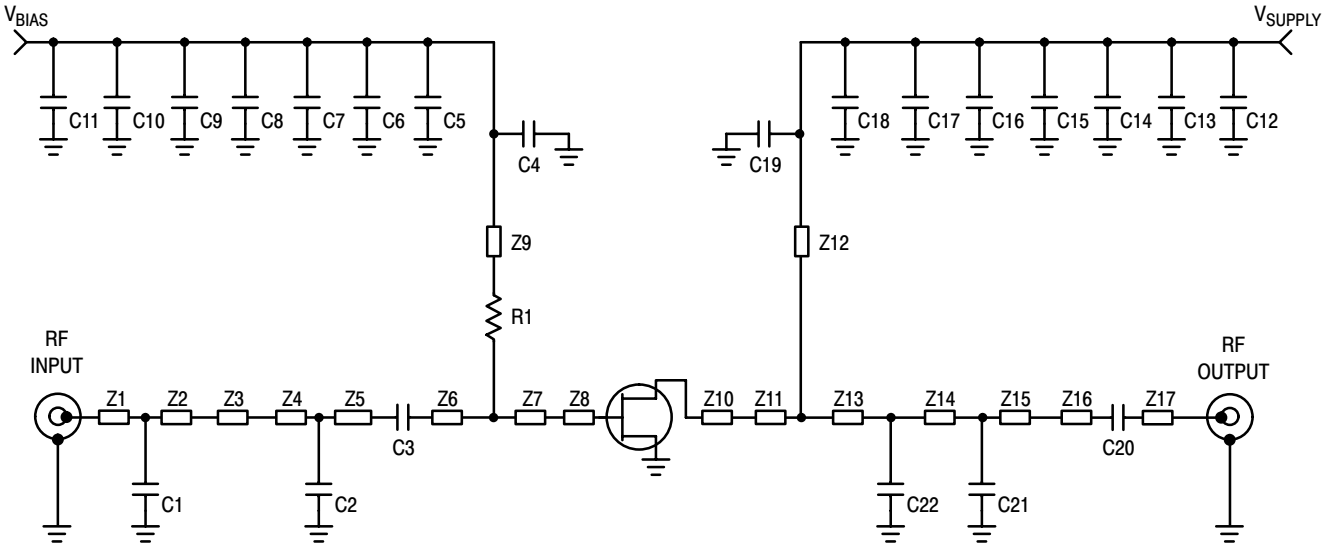
1. For reliable operation, the operating channel temperature should not exceed 150°C.
2. Simulated.

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Table 4. Electrical Characteristics (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Saturated Drain Current (V_{DS} = 3.5 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	2.9	—	Adc
Off State Leakage Current (V_{GS} = -0.4 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	< 1.0	100	μAdc
Off State Drain Current (V_{DS} = 12 Vdc, V_{GS} = -1.9 Vdc)	I_{DSO}	—	0.1	1.0	mAdc
Off State Current (V_{DS} = 28.5 Vdc, V_{GS} = -2.5 Vdc)	I_{DSX}	—	2.0	15	mAdc
Gate-Source Cut-off Voltage (V_{DS} = 3.5 Vdc, I_{DS} = 15 mA)	$V_{GS(th)}$	-1.2	-1.0	-0.7	Vdc
Quiescent Gate Voltage (V_{DS} = 12 Vdc, I_{DQ} = 180 mA)	$V_{GS(Q)}$	-1.2	-0.95	-0.7	Vdc
Power Gain (V_{DD} = 12 Vdc, I_{DQ} = 180 mA, f = 3.55 GHz)	G_{ps}	9.0	10	—	dB
Output Power, 1 dB Compression Point (V_{DD} = 12 Vdc, I_{DQ} = 180 mA, f = 3.55 GHz)	P1dB	—	9	—	W
Drain Efficiency (V_{DD} = 12 Vdc, I_{DQ} = 180 mA, P_{out} = 900 mW Avg., f = 3.55 GHz)	η_D	23	28	—	%
Adjacent Channel Power Ratio (V_{DD} = 12 Vdc, P_{out} = 900 mW Avg., I_{DQ} = 180 mA, f = 3.55 GHz, W-CDMA, 8.5 P/A @ 0.01% Probability, 64 CH, 3.84 MCPS)	ACPR	—	-43	-40	dBc

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Z1	0.045″ x 0.689″ Microstrip	Z11	0.400″ x 0.215″ Microstrip
Z2	0.045″ x 0.089″ Microstrip	Z12	0.025″ x 0.497″ Microstrip
Z3	0.020″ x 0.360″ Microstrip	Z13	0.025″ x 0.271″ Microstrip
Z4	0.045″ x 0.029″ Microstrip	Z14	0.025″ x 0.363″ Microstrip
Z5	0.045″ x 0.061″ Microstrip	Z15	0.025″ x 0.041″ Microstrip
Z6	0.045″ x 0.055″ Microstrip	Z16	0.045″ x 0.050″ Microstrip
Z7	0.300″ x 0.125″ Microstrip	Z17	0.045″ x 0.467″ Microstrip
Z8, Z10	0.146″ x 0.070″ Microstrip	PCB	Rogers 4350, 0.020″, ε_r = 3.5
Z9	0.025″ x 0.485″ Microstrip		

Figure 1. 3.5 GHz Test Circuit Schematic

Table 5. 3.5 GHz Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C21, C22	0.5 pF Chip Capacitors	08051J0R5BBT	AVX
C2	0.2 pF Chip Capacitor	06035J0R2BBT	AVX
C3	0.5 pF Chip Capacitor	06035J0R5BBT	AVX
C4, C19, C20	6.8 pF Chip Capacitors	08051J6R8BBT	AVX
C5, C18	10 pF Chip Capacitors	100A100JP150X	ATC
C6, C17	100 pF Chip Capacitors	100A101JP150X	ATC
C7, C16	100 pF Chip Capacitors	100B101JP500X	ATC
C8, C15	1000 pF Chip Capacitors	100B102JP50X	ATC
C9, C14	0.1 μF Chip Capacitors	CDR33BX104AKWS	Kemet
C10, C13	39K pF Chip Capacitors	200B393KP50X	ATC
C11, C12	10 μF Chip Capacitors	GRM55DR61H106KA88B	Kemet
R1	47 Ω Chip Resistor	D55342M07B47JOR	Newark

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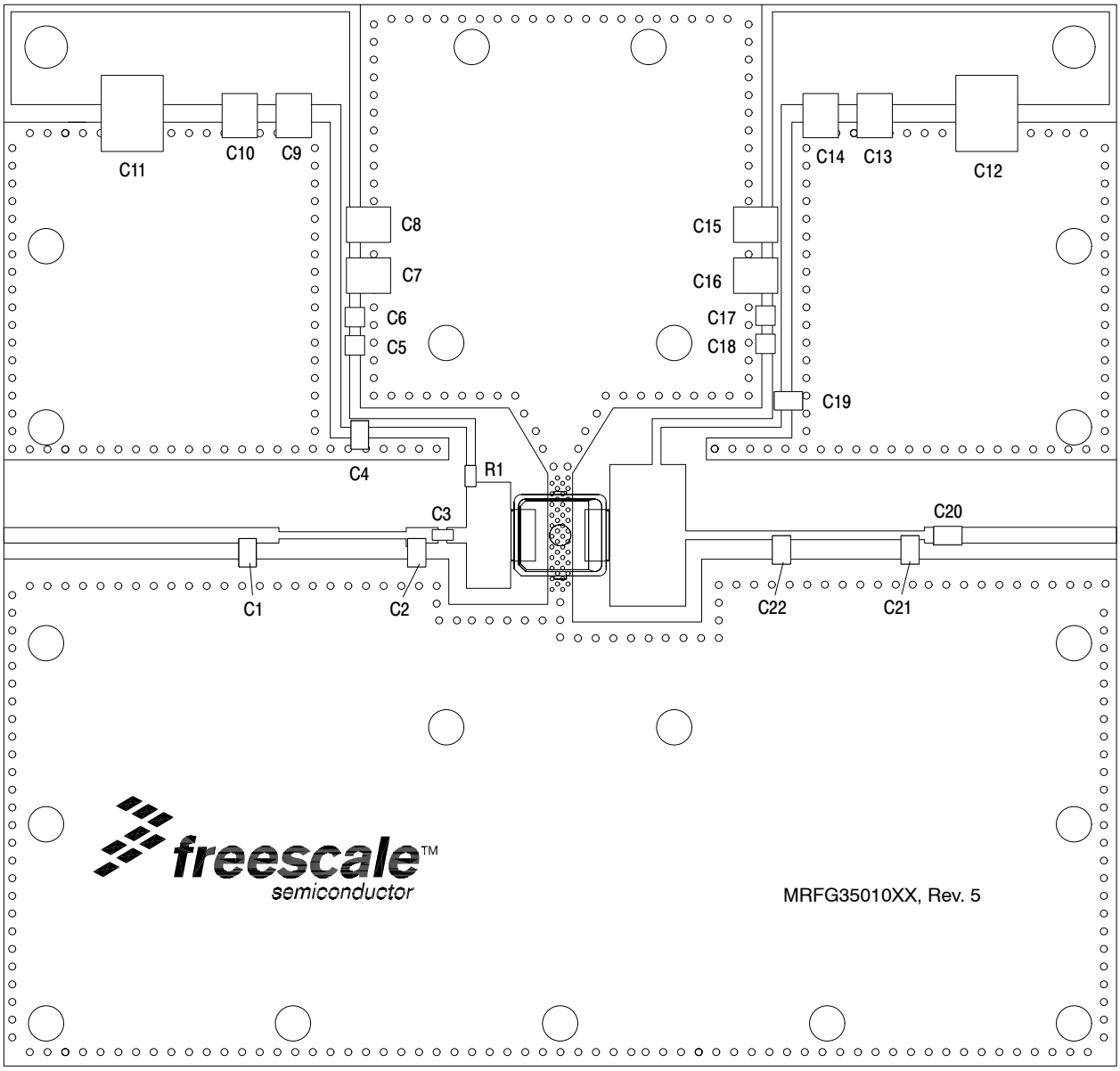


Figure 2. 3.5 GHz Test Circuit Component Layout

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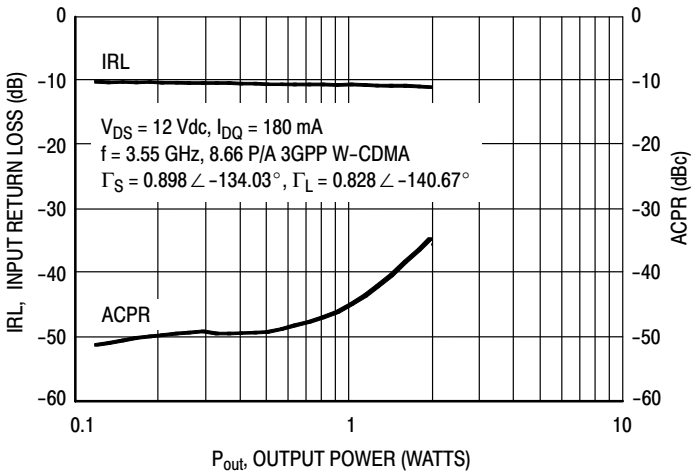


Figure 3. W-CDMA ACPR and Input Return Loss versus Output Power

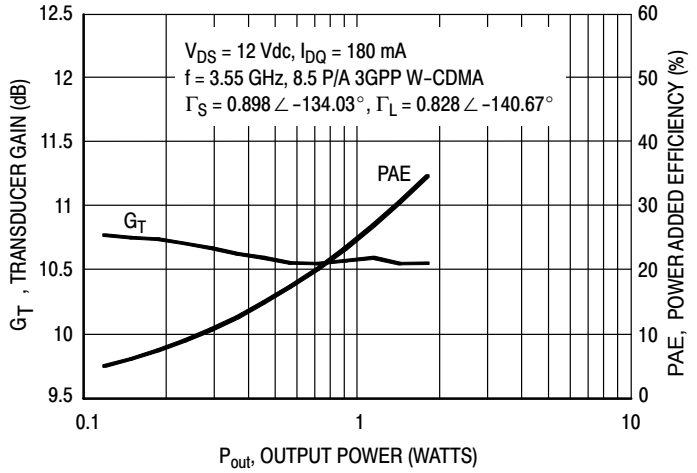


Figure 4. Transducer Gain and Power Added Efficiency versus Output Power

NOTE: All data is referenced to package lead interface. Γ_S and Γ_L are the impedances presented to the DUT. All data is generated from load pull, not from the test circuit shown.

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Table 6. Class AB Common Source S-Parameters at V_{DS} = 12 Vdc, I_{DQ} = 180 mA

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	∠ ϕ	$\|S_{21}\|$	∠ ϕ	$\|S_{12}\|$	∠ ϕ	$\|S_{22}\|$	∠ ϕ
0.5	0.946	-177.11	4.710	82.28	0.016	8.19	0.759	-179.39
0.55	0.945	-178.28	4.303	80.79	0.016	7.57	0.758	-179.99
0.6	0.944	-179.44	3.963	79.23	0.016	7.60	0.758	179.39
0.65	0.945	179.50	3.674	77.69	0.016	7.44	0.758	178.74
0.7	0.945	178.60	3.427	76.28	0.016	7.44	0.757	177.98
0.75	0.944	177.66	3.211	74.83	0.016	7.21	0.757	177.28
0.8	0.945	176.74	3.023	73.24	0.017	7.65	0.756	176.57
0.85	0.945	175.95	2.853	71.74	0.017	7.16	0.756	175.75
0.9	0.944	175.17	2.705	70.36	0.017	7.34	0.756	174.99
0.95	0.945	174.36	2.570	68.88	0.017	7.31	0.755	174.18
1	0.945	173.63	2.447	67.47	0.017	7.08	0.755	173.33
1.05	0.944	172.90	2.337	66.06	0.017	7.29	0.756	172.51
1.1	0.944	172.09	2.234	64.52	0.017	7.56	0.756	171.82
1.15	0.944	171.29	2.139	63.11	0.017	7.46	0.756	171.01
1.2	0.944	170.57	2.052	61.73	0.017	7.43	0.757	170.22
1.25	0.943	169.71	1.971	60.26	0.017	7.47	0.757	169.52
1.3	0.944	168.85	1.894	58.81	0.017	7.28	0.757	168.83
1.35	0.940	168.20	1.823	57.49	0.017	7.56	0.755	168.39
1.4	0.946	167.07	1.754	56.13	0.017	7.92	0.762	167.55
1.45	0.943	166.35	1.691	54.75	0.018	7.59	0.759	167.32
1.5	0.944	163.30	1.626	53.36	0.017	7.06	0.762	169.20
1.55	0.943	162.54	1.573	52.16	0.017	7.24	0.763	168.75
1.6	0.942	161.81	1.523	50.87	0.017	7.48	0.764	168.22
1.65	0.945	161.17	1.474	49.56	0.018	7.46	0.765	167.71
1.7	0.946	160.55	1.429	48.35	0.017	7.46	0.766	167.18
1.75	0.945	160.01	1.387	47.14	0.018	7.84	0.767	166.73
1.8	0.945	159.48	1.348	45.88	0.018	7.89	0.767	166.15
1.85	0.947	159.00	1.310	44.70	0.018	7.97	0.768	165.58
1.9	0.946	158.52	1.274	43.55	0.018	7.87	0.770	165.10
1.95	0.945	158.06	1.240	42.30	0.018	7.89	0.769	164.54
2	0.948	157.71	1.209	41.23	0.018	7.61	0.771	164.05
2.05	0.947	157.30	1.179	40.16	0.018	7.78	0.772	163.59
2.1	0.947	156.92	1.152	39.09	0.018	7.65	0.773	163.12
2.15	0.948	156.58	1.127	37.97	0.018	7.40	0.773	162.56
2.2	0.948	156.32	1.102	36.90	0.019	7.22	0.773	162.01
2.25	0.948	156.04	1.079	35.82	0.019	6.98	0.775	161.53
2.3	0.949	155.73	1.058	34.70	0.019	7.24	0.775	161.05
2.35	0.949	155.33	1.037	33.62	0.019	7.52	0.775	160.43
2.4	0.948	154.99	1.019	32.54	0.019	7.60	0.776	159.99
2.45	0.948	154.57	1.002	31.44	0.019	7.49	0.777	159.53
2.5	0.948	154.13	0.986	30.35	0.019	7.69	0.776	158.91
2.55	0.946	153.68	0.971	29.28	0.019	8.05	0.777	158.40
2.6	0.946	153.15	0.957	28.12	0.020	8.01	0.777	157.88
2.65	0.946	152.54	0.943	26.91	0.020	8.01	0.776	157.34
2.7	0.945	151.98	0.930	25.73	0.020	7.82	0.777	156.80
2.75	0.943	151.22	0.918	24.52	0.021	7.27	0.778	156.36

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Table 6. Class AB Common Source S-Parameters at V_{DS} = 12 Vdc, I_{DQ} = 180 mA (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
2.8	0.943	150.66	0.906	23.27	0.021	6.42	0.776	155.80
2.85	0.943	149.88	0.894	22.02	0.022	5.21	0.777	155.28
2.9	0.942	149.16	0.883	20.80	0.021	4.17	0.778	154.81
2.95	0.942	148.32	0.872	19.56	0.021	4.03	0.778	154.25
3	0.943	147.41	0.862	18.28	0.021	3.53	0.778	153.67
3.05	0.942	146.51	0.853	16.96	0.022	3.11	0.780	153.18
3.1	0.940	145.45	0.842	15.64	0.022	2.65	0.780	152.64
3.15	0.940	144.41	0.833	14.29	0.022	2.43	0.779	152.04
3.2	0.941	143.33	0.823	13.00	0.022	2.48	0.782	151.43
3.25	0.938	142.25	0.814	11.67	0.022	2.48	0.781	150.92
3.3	0.939	141.15	0.804	10.32	0.022	2.08	0.781	150.33
3.35	0.939	140.02	0.795	8.97	0.022	1.99	0.782	149.74
3.4	0.938	138.89	0.785	7.61	0.022	2.11	0.783	149.19
3.45	0.938	137.88	0.776	6.26	0.023	2.05	0.782	148.72
3.5	0.939	136.68	0.767	4.96	0.023	1.79	0.783	147.97
3.55	0.938	135.63	0.757	3.67	0.023	1.56	0.785	147.40
3.6	0.938	134.63	0.748	2.34	0.024	1.02	0.783	146.88
3.65	0.939	133.60	0.739	1.04	0.024	0.44	0.783	146.20
3.7	0.938	132.68	0.729	-0.25	0.024	-0.54	0.785	145.61
3.75	0.937	131.84	0.720	-1.47	0.024	-1.30	0.785	145.17
3.8	0.937	130.92	0.711	-2.69	0.024	-1.98	0.785	144.52
3.85	0.938	130.07	0.702	-3.89	0.024	-2.38	0.786	143.87
3.9	0.938	129.29	0.694	-5.07	0.024	-2.22	0.787	143.24
3.95	0.939	128.60	0.686	-6.23	0.024	-2.00	0.787	142.61
4	0.939	127.88	0.678	-7.34	0.025	-1.80	0.788	141.94
4.05	0.939	127.23	0.671	-8.46	0.025	-2.04	0.789	141.34
4.1	0.941	126.66	0.664	-9.57	0.025	-2.17	0.789	140.69
4.15	0.941	126.23	0.658	-10.65	0.025	-2.15	0.788	140.01
4.2	0.940	125.73	0.651	-11.72	0.026	-2.48	0.789	139.31
4.25	0.939	125.28	0.645	-12.82	0.026	-2.81	0.789	138.65
4.3	0.940	124.85	0.640	-13.86	0.026	-2.79	0.788	137.91
4.35	0.940	124.45	0.635	-14.92	0.027	-2.73	0.789	137.16
4.4	0.939	124.01	0.630	-16.00	0.027	-3.22	0.789	136.45
4.45	0.939	123.63	0.627	-17.01	0.028	-3.26	0.788	135.67
4.5	0.939	123.27	0.623	-18.03	0.028	-3.64	0.788	134.88
4.55	0.937	122.84	0.620	-19.03	0.029	-3.74	0.789	134.16
4.6	0.937	122.32	0.619	-20.17	0.029	-4.57	0.788	133.36
4.65	0.937	121.88	0.618	-21.26	0.030	-5.02	0.788	132.50
4.7	0.936	121.36	0.617	-22.45	0.030	-6.01	0.788	131.67
4.75	0.935	120.72	0.615	-23.68	0.031	-7.22	0.787	130.83
4.8	0.935	120.04	0.614	-24.90	0.031	-7.64	0.786	129.91
4.85	0.934	119.35	0.613	-26.12	0.031	-8.05	0.786	129.03
4.9	0.932	118.49	0.613	-27.41	0.031	-8.39	0.786	128.20
4.95	0.931	117.69	0.614	-28.72	0.032	-8.32	0.785	127.24
5	0.929	116.74	0.614	-30.05	0.033	-8.48	0.786	126.32

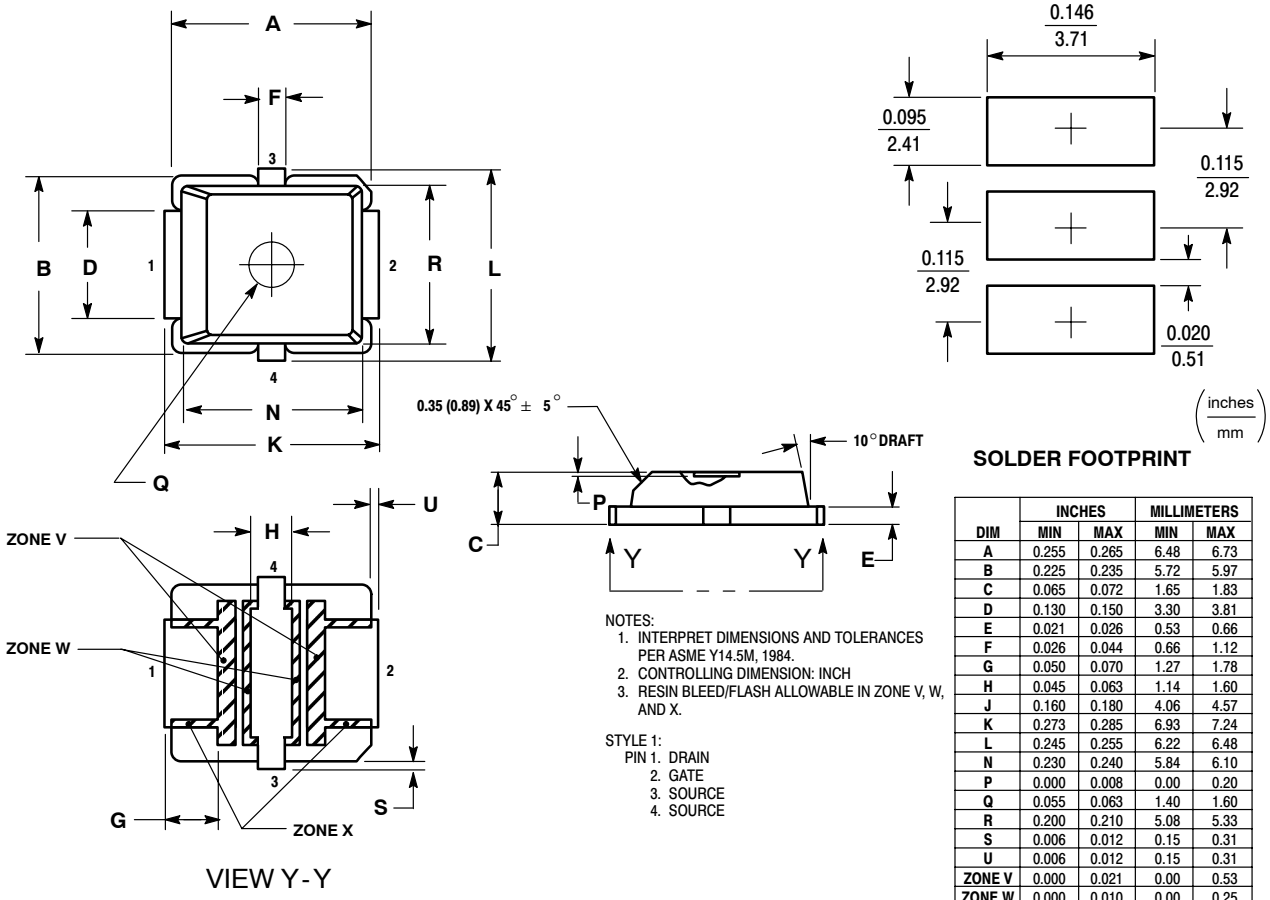
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NOTES

NOTES

NOTES

PACKAGE DIMENSIONS



VIEW Y-Y

SOLDER FOOTPRINT

NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1984.
2. CONTROLLING DIMENSION: INCH
3. RESIN BLEED/FLASH ALLOWABLE IN ZONE V, W, AND X.

STYLE 1:
PIN 1. DRAIN
2. GATE
3. SOURCE
4. SOURCE

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.255	0.265	6.48	6.73
B	0.225	0.235	5.72	5.97
C	0.065	0.072	1.65	1.83
D	0.130	0.150	3.30	3.81
E	0.021	0.026	0.53	0.66
F	0.026	0.044	0.66	1.12
G	0.050	0.070	1.27	1.78
H	0.045	0.063	1.14	1.60
J	0.160	0.180	4.06	4.57
K	0.273	0.285	6.93	7.24
L	0.245	0.255	6.22	6.48
N	0.230	0.240	5.84	6.10
P	0.000	0.008	0.00	0.20
Q	0.055	0.063	1.40	1.60
R	0.200	0.210	5.08	5.33
S	0.006	0.012	0.15	0.31
U	0.006	0.012	0.15	0.31
ZONE V	0.000	0.021	0.00	0.53
ZONE W	0.000	0.010	0.00	0.25
ZONE X	0.000	0.010	0.00	0.25

CASE 466-03
ISSUE D
PLD-1.5
PLASTIC

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